

- 1    1. An electric power-generating device comprising:  
2        a main input shaft turned by a source of energy;  
3    a synchronous generator operatively connected to said main input shaft, an output of said  
4    synchronous generator being AC electrical power;  
5    a passive rectifier connected to said output of said synchronous generator, an output of  
6    said passive rectifier being DC electrical power; and,  
7    an inverter connected to said output of said passive rectifier, an output of said inverter  
8    being AC electrical power.  
9
- 10   2. The electric power-generating device of claim 1 wherein said device includes a  
11   plurality of synchronous generators operatively connected to said main input shaft.  
12
- 13   3. The electric power-generating device of claim 2 further comprising a controller that  
14   brings each generator of said plurality of synchronous generators online sequentially in  
15   the event of low energy conditions of said source of energy to improve system efficiency  
16   at low power.  
17
- 18   4. The electric power-generating device of claim 3 wherein said controller alternates the  
19   sequence in which said controller shifts the order in which said generators are brought  
20   online such that each generator receives substantially similar utilization.  
21
- 22   5. The electric power-generating device of claim 1 wherein electric power-generating  
23   device is a wind turbine that includes said generator, and said passive rectifier, said wind  
24   turbine being located at the top of a tower and wherein said inverter is located at the  
25   bottom of said tower.  
26
- 27   6. The electric power-generating device of claim 5 wherein a set of power cables conduct  
28   electrical power from the top of said tower to the bottom of said tower and wherein said  
29   power cables conduct DC electrical power.  
30

1 7. The electric power-generating device of claim 6 wherein said set of power cables  
2 consist of two cables per generator.

3  
4 8. The electric power-generating device of claim 1 wherein said passive rectifier  
5 comprises a plurality of diodes that convert AC electrical power into DC electrical power.

6  
7 9. The electric power-generating device of claim 8 wherein said generator is a three-  
8 phase synchronous generator and wherein said passive rectifier comprises six diodes.

9  
10 10. The electric power-generating device of claim 1 further comprising a controller that  
11 controls generator torque by regulating the current in said DC electrical power.

12  
13 11. The electric power-generating device of claim 10 wherein the voltage of said DC  
14 electrical power is measured and used as an input to said controller.

15  
16 12. The electric power-generating device of claim 11 further comprising a band pass filter  
17 for said voltage measurement that is tuned to measure vibrations in mechanical portions  
18 of said electric power-generating device at a predetermined resonant frequency and  
19 wherein said controller provides a generator torque signal that cancels and dampens  
20 vibrations.

21  
22 13. The electric power-generating device of claim 1 further comprising a controller that  
23 measures vibrations in mechanical portions of said electric power-generating device and  
24 controls generator torque to actively dampen said vibrations.

25  
26 14. The electric power-generating device of claim 13 wherein said controller measures  
27 said vibrations by measuring the voltage of said DC electrical power.

28  
29 15. The electric power-generating device of claim 14 further comprising a band pass filter  
30 in said controller to filter said DC electrical power to a predetermined frequency that

1 corresponds to a mechanical resonance in said mechanical portions of said electric  
2 power-generating device.

3  
4 16. A fluid-flow turbine comprising:

5 a blade for converting fluid-flow power into mechanical power;

6 a plurality of generators operatively connected to said blade for converting said  
7 mechanical power into AC electrical power;

8 a passive rectifier electrically connected to each of said generators for converting  
9 said AC electrical power into DC electrical power; and

10 an inverter electrically connected to each of said passive rectifiers to convert said  
11 DC electrical power into AC electrical power.

12  
13 17. The electric power-generating device of claim 16 further comprising a controller for  
14 bringing each generator online sequentially in low fluid-flow conditions to improve  
15 system efficiency at low power.

16  
17 18. The electric power-generating device of claim 17 wherein said controller alternates  
18 the sequence in which said controller shifts the order in which said generators are brought  
19 online such that each generator receives substantially similar utilization.

20  
21 19. A fluid-flow farm comprising:

22 a plurality of fluid-flow turbines each of which converts fluid-flow power into AC  
23 electrical power at substantially unity power factor;

24 an electrical collection system that electrically connects each of said fluid-flow  
25 turbines to a substation wherein said electrical collection system is sized for operation of  
26 said fluid-flow turbines at substantially unity power factor; and

27 a dynamically adjustable power factor controller at said substation for adjusting  
28 the power factor of the aggregate output of said fluid-flow farm.

29  
30 20. A fluid-flow farm comprising:

1 a plurality of fluid-flow turbines each of which converts fluid-flow power into AC  
2 electrical power at substantially unity power factor;

3 each one of said fluid-flow turbines comprising a blade which converts fluid-flow  
4 power into mechanical power, a synchronous generator operatively connected to said  
5 blade to convert said mechanical power into AC electrical power, a passive rectifier to  
6 convert said AC electrical power into DC electrical power, and an inverter to convert said  
7 DC electrical power into AC electrical power;

8 an electrical collection system that electrically connects each of said fluid-flow  
9 turbines to a substation wherein said electrical collection system is sized for operation of  
10 said fluid-flow turbines at substantially unity power factor; and,

11 a dynamically adjustable power factor controller at said substation for adjusting  
12 the power factor of the aggregate output of said fluid-flow farm.

13  
14 21. An apparatus for generating electric power comprising:

15 first means for converting fluid-flow power into mechanical power;

16 a plurality of generators connected to said first means for converting said  
17 mechanical power into AC electrical power;

18 rectifying means connected to said plurality of generators for rectifying outputs of  
19 said generators to thereby convert said AC electrical power of said generators into DC  
20 electrical power; and

21 inverting means connected to said rectifying means for inverting said DC  
22 electrical power to thereby convert said DC electrical power to AC electrical power.

23  
24 22. The apparatus of claim 21 further comprising:

25 means for bringing each of said generators online sequentially in low fluid-flow  
26 conditions to improve system efficiency at low power.

27  
28 23. The apparatus of claim 22 wherein the order in which said generators are brought  
29 online is such that each generator receives substantially similar utilization.

30  
31 24. An apparatus for generating electric power comprising:

1 a plurality of fluid-flow turbines, each of which converts fluid-flow power into  
2 AC electrical power at substantially unity power factor;  
3 an electrical collection system for electrically connecting each of said fluid-flow  
4 turbines to a substation wherein said electrical collection system is sized for operation of  
5 said fluid-flow turbines at substantially unity power factor; and  
6 means at said substation for dynamically adjusting the power factor of the  
7 aggregate output of said plurality of fluid-flow turbines.

8  
9 25. A apparatus for generating electric power comprising:

10 a plurality of fluid-flow turbines, each of which utilizing a blade to drive  
11 synchronous generators that convert fluid-flow power into AC electrical power at  
12 substantially unity power factor;  
13 converting means associated with each turbine for converting said AC electrical  
14 power of said synchronous generators into DC electrical power;  
15 means for inverting said DC electrical power of each said synchronous generators of a  
16 turbine to thereby convert said DC electrical power to AC electrical power;  
17 an electrical collection system for electrically connecting each of said fluid-flow  
18 turbines to a substation wherein said electrical collection system is sized for operation of  
19 said fluid-flow turbines at substantially unity power factor; and,  
20 means for dynamically adjusting the power factor of the aggregate output of said  
21 plurality of fluid-flow turbines at said substation.

22  
23 26. The apparatus of claim 25 further comprising:

24 a number of towers, one for each of said plurality of turbines;  
25 each turbine and an associated converting means being located on top of one of said  
26 towers; and,  
27 said means for inverting being located at a bottom of said tower.

28  
29 27. The apparatus of claim 26 further comprising:

30 means for conducting DC electrical power electrical power from said converting  
31 means at said top of said tower to said inverting means at said bottom of said tower.

1

2 28. A method of generating electric power comprising steps of:

3 A. converting fluid-flow power into mechanical power;

4 B. utilizing a plurality of generators to convert said mechanical power into AC  
5 electrical power;6 C. rectifying outputs of said generators to thereby convert said AC electrical  
7 power of said generators into DC electrical power; and8 D. inverting said DC electrical power to thereby convert said DC electrical power  
9 to AC electrical power.

10

11 29. The method of claim 28 further comprising a step of:

12 E. bringing each of said generators online sequentially in low fluid-flow  
13 conditions to improve system efficiency at low power.

14

15 30. The method of claim 29 wherein in said step E the order in which said generators are  
16 brought online is such that each generator receives substantially similar utilization.

17

18 31. A method of generating electric power comprising steps of:

19 A. providing a plurality of fluid-flow turbines, each of which converts fluid-flow  
20 power into AC electrical power at substantially unity power factor;21 B. electrically connecting each of said fluid-flow turbines via an electrical  
22 collection system to a substation wherein said electrical collection system is sized for  
23 operation of said fluid-flow turbines at substantially unity power factor; and24 C. dynamically adjusting the power factor of the aggregate output of said plurality  
25 of fluid-flow turbines at said substation.

26

27 32. A method of generating electric power comprising steps of:

28 A. providing a plurality of fluid-flow turbines, each of which utilizing a blade to  
29 drive synchronous generators that convert fluid-flow power into AC electrical power at  
30 substantially unity power factor;

1           B. rectifying outputs of each said synchronous generators of a turbine to thereby  
2 convert said AC electrical power of said synchronous generators into DC electrical  
3 power;

4           C. inverting said DC electrical power of each said synchronous generators of a  
5 turbine to thereby convert said DC electrical power to AC electrical power;

6           D. electrically connecting each of said fluid-flow turbines via an electrical  
7 collection system to a substation wherein said electrical collection system is sized for  
8 operation of said fluid-flow turbines at substantially unity power factor; and,

9           E. dynamically adjusting the power factor of the aggregate output of said plurality  
10 of fluid-flow turbines at said substation.

11  
12 33. The method of claim 32 wherein:

13           said step A of providing a plurality of fluid-flow turbines includes the step of  
14 providing a plurality of towers with each one of said turbines on top of one of said  
15 towers;

16           said step B of rectifying outputs of each said generators is performed at said top  
17 of said one tower; and,

18           said step C of inverting said DC electrical power of each said synchronous  
19 generators of a turbine to thereby convert said DC electrical power to AC electrical  
20 power is performed at a bottom of said one tower.

21  
22 34. The method of claim 33 further comprising a step of:

23           F. conducting DC electrical power electrical power from said top of one tower to  
24 said bottom of said one tower prior to said step C of inverting said DC electrical power of  
25 each said synchronous generators of a turbine.